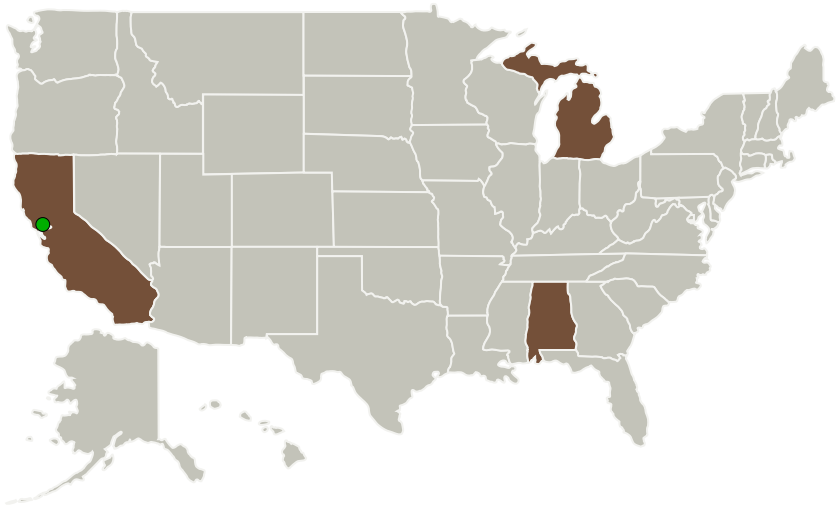
An Electrochemical, Point-of-Care Detector for Reagent-free, In-situ Diagnostics of Pathogens, Phase I

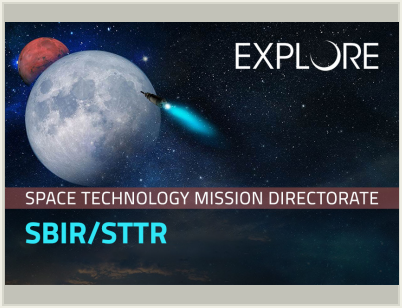
Completed Technology Project (2012 - 2013)

Project Introduction

For long-term exploratory space travel, there will be a critical need for in-situ diagnosis and assessment of biological specimens from symptomatic astronauts, especially, disease pathogens (virus, bacterium, or fungus) and microbial contaminants. Hence, a real-time, non-culture-based microbial detection, identification and quantification system for on-flight monitoring and evaluation of pathogens from astronauts, or the space environment, is strongly desired. The success of such diagnostic tasks critically depends upon the degree of automation and reliability of such trace level detection. To meet this need, we propose to develop a novel miniaturized, point-of-care (POC) detector for reagent-free, no-culturing, in-situ diagnostics of disease pathogens. The envisioned device will be compact, lightweight, fully integrated and automated (requiring minimum human intervention), and highly cost-effective and power-efficient. In Phase I, we will develop a new type of electrochemical molecules and fabricate solid electrode-based probe for in-vitro demonstration of accurate and effective signal transduction of selective binding of pathogenic cells to the electrode as proof-of-principle. In Phase II, the electrode probe will be optimized to increase specificity, sensitivity, stability, and the response to regular biological samples. Finally, the sensor will be integrated with a compact handheld instrument for data collection, analysis and processing and interfacing with existing NASA space instrumentation for both terrestrial and microgravity environments evaluation.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
CFD Research Corporation	Lead Organization	Industry	Huntsville, Alabama
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California
Michigan Technological University(MTU)	Supporting Organization	Academia	Houghton, Michigan

Primary U.S. Work Locations	
Alabama	California
Michigan	

Project Transitions

February 2012: Project Start

February 2013: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138003)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

CFD Research Corporation

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

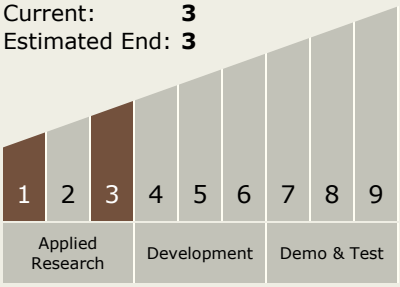
Carlos Torrez

Principal Investigator:

Jianjun Wei

Technology Maturity (TRL)

Start: **1**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.1 Detectors and Focal Planes

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System